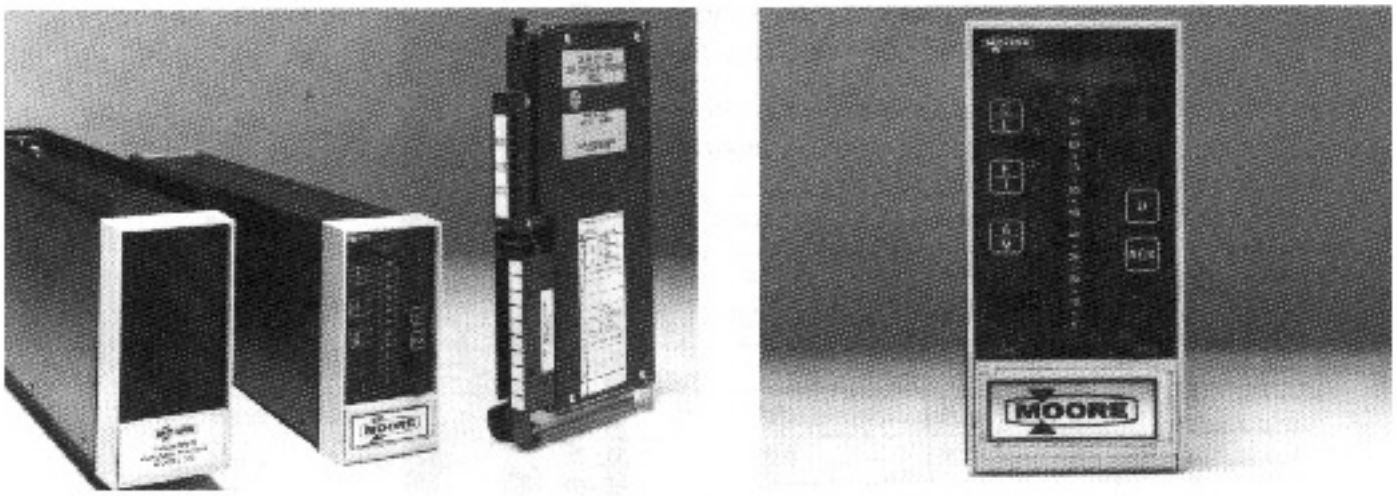
Allen–Bradley
Loop Controller Interface Module
(Cat. No. 1771–LIA)

Product Data



The Loop Controller Interface Module (Cat. No. 1771–LIA) allows PLC–2, PLC–3 and PLC–5 family programmable controllers to communicate with Moore Products Model 352 single–loop PID controllers via the Model 320 Independent Computer Interface.

Introducing the Loop Controller Interface Module

The loop controller interface module receives generic and controller specific commands from the Programmable Controller (PC) and interprets, verifies, and processes them by generating the necessary link to the loop controllers. The 1771–LIA module can communicate with up to 31 loop controllers through an RS–422 serial link.

The Loop Controller Interface Module can:

- monitor/change setpoint, valve, and operating mode, and acknowledge, set, reset alarms
- define station address/loop numbers for status reporting to the programmable controller
- examine/change PID parameters, alarm points, and output limits
- transfer configuration to a loop controller, programmable controller, or receive a configuration from a programmable controller.

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Description of the Loop Controller Interface Module

The Loop Controller is shown in figure 1. Interface Module commands are shown in table A.

Figure 1
Loop Controller Interface Module (Cat. No. 1771–LIA)

Table A
Loop Controller Interface Module (1771–LIA) Commands

FUNCTION	COMMAND	CODE	RESPONSE
Change the setpoint, output, operating mode, acknowledge, enable, disable alarms	SET CONTROL	01H	LOOP STATUS
Examine PID parameters, alarm limits, and output limits	READ PARAMETER	02H	READ PARAM ACK
Change PID parameters, alarm limits and output limits	MODIFY PARAMETER	03H	MOD PARAM ACK
Transfer a configuration from a station to a 1771–LIA	UPLOAD	04H	UPLOAD ACK
Transfer a configuration from a 1771–LIA to a station	DOWNLOAD	05H	DOWNLOAD ACK
Transfer a configuration from a 1771–LIA to a PC	READ CONFIG	06H	READ CONF ACK
Transfer a configuration from the PC to the 1771–LIA	WRITE CONFIG	07H	WRITE CONF ACK
Sends an ICI command to the ICI	ICI COMMAND	08H	ICI ACK

Compatibility

The user must be familiar with the terminology, configuration and operation of Moore Products Model 352 Single Loop Digital Controller (SLDC) and Model 320 Independent Computer Interface (ICI). Depending on the application, you must also be familiar with Moore Products Model 321 Local Expansion Satellite (LES).

Proper operation of the Loop Controller Interface Module depends upon correct setup of the Model 320 ICI. Set the ICI as follows:

Parameter	Setup	Switch Location
ICI link address	(see note)	serial board SW1, 2
Baud rate	9600	serial board W7
RS–232–C/RS–422	RS–422	serial board W5, W6
Transmission method	Binary	MPU board SW5 closed
Link Acknowledgement Delay	Enabled	MPU board SW4 open
Null filling	Enabled	MPU board SW3 open
Send command security	Disabled	MPU board SW1, 2
Format	1 start, 8 data, 1 stop, no parity	SW2 – 8 off, SW2 – 4 on

Note: The 1771–LIA provides an interface with up to 61 Moore Products 352 controllers, depending on the Moore hardware configuration.

Refer to Moore Products publications AD320–10 (Local Instrument Link Computer Interface User's Manual), AD352–10 (MYCRO 352 Single Loop Digital Controller User's Manual) and AD321–40 (Model 321 Expansion Satellite Link Interface Communication User's Manual).

Installing the Loop Controller Interface Module

In this section we tell you how to initially handle your loop controller interface module, key your I/O chassis, install your your module and make your wiring connections.

Initial Handling

ATTENTION: Remove power from the 1771 I/O chassis backplane and wiring arm before removing or installing the loop controller interface module.

- Failure to remove power from the backplane or wiring arm could cause module damage, degradation of performance, or injury.
- Failure to remove power from the backplane could cause injury or equipment damage due to possible unexpected operation.

The loop controller interface module contains components which can be damaged by electrostatic discharge. The module is shipped in an electrostatic shielded bag for protection. Follow the handling procedures outlined below to guard against damage to your module.

ATTENTION: Under some conditions, electrostatic discharge can degrade performance or damage the module. Read and observe the following precautions to guard against electrostatic damage.

- Touch a grounded object to discharge yourself before handling the module.
- Do not touch the backplane connector or connector pins.
- If you configure or replace internal components, do not touch other circuit components inside the module. If available, use a static–safe work station.

When not in use, keep the module in its static–free shield bag.

Keying the I/O Chassis

Use the plastic keying bands, shipped with each I/O chassis, to key your I/O slots to accept only this type of module. Place the keying bands on the chassis backplane between:

- 12 and 14
- 16 and 18

Slots on the rear edge of the circuit board (figure 1) are matched to these slots to allow insertion of this type of module. You can key any connector in an I/O chassis to receive this module except for the left–most connector reserved for adapter or processor modules.

Inserting the Module Into the Chassis

1. Position the module so that the circuit board on the rear of the module lines up with the top and bottom card guides in the chassis.

2. Slide the module into the chassis.

3. Press firmly to seat the module in the chassis backplane connector.

4. Swing the module locking latch down into place over the front edge of the module.

Connecting the Loop Controller to the Module

You make connections to the module through the 1771–WA field wiring arm. The arm pivots on the I/O chassis to connect with terminals on the front of the module and acts as a terminal strip. The wiring arm allows the module to be removed from the chassis without disconnecting wiring.

Make certain all power is removed from the module before making wiring connections.

1. Swing the wiring arm up into position on the front of the module. The locking tab on the module will secure it into place.

2. Make your connections to the field wiring arm as shown in figure 2. (Use the label on the front of the wiring arm to identify your wiring.)

NOTE: Use twinaxial cable (cat. no. 1770–CD), or an equivalent shielded twisted–pair cable with a minimum impedance of 60 ohms and a maximum capacitance of 75pF per meter, for the serial link. Do not exceed 4000 ft.

Figure 2
Preparing the Connecting Wiring

3. Refer to figure 2. Strip 2 inches of the outer insulation from the cable end which will connect to the wiring arm.

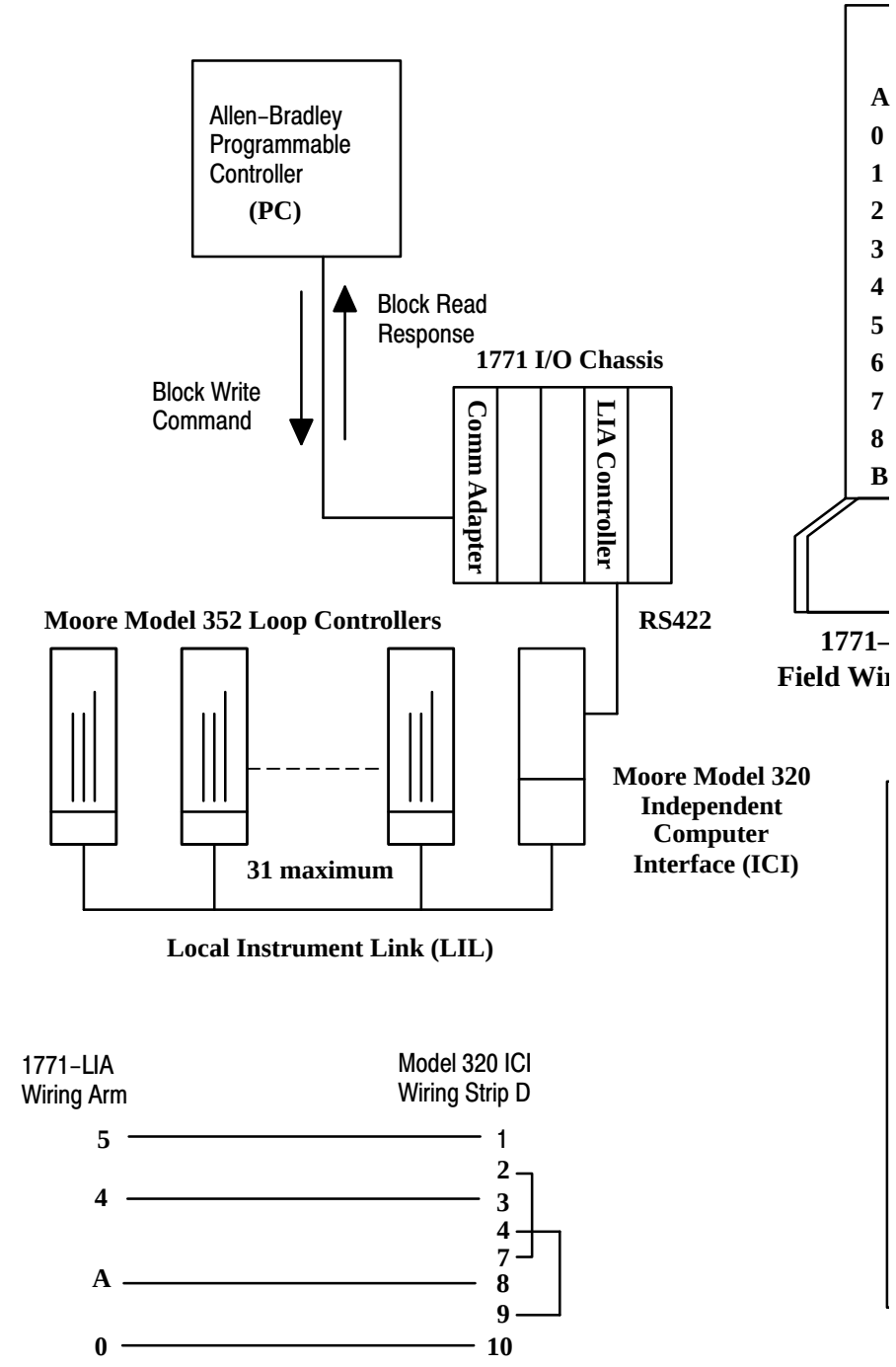
4. Remove exposed foil.

5. Strip 3/8 inch of insulation from the end of each wire.

6. Connect the wires to the swing arm as shown in figure 3.

ATTENTION: The field wiring arm terminal identification number is not the same as the number of the bit which controls that output.

Figure 3
Wiring the Loop Controller Interface Module and the Model 320 Independent Computer Interface



Programmable Controller Data Table Requirements

You must allocate two blocks of memory within the programmable controller's data table for use by the interface module. The module requires this memory for block transfer read and write files. Refer to the appropriate programmable controller user's manual for information on how to set up the data table.

The maximum length of the block transfer write (BTW) file is 64 words. Set the length of the write file to the default value of 00.

The maximum length of the block transfer read (BTR) file is 64 words. Set the length of the read file to the default value of 00.

Setting the length of the files to the default value of 00 allows the module to determine the proper file length.

You will also need to allocate portions of the data table for the files related to the module's commands.

Set Control Command

The Set Control command is used to supply basic control and status command changes to one or more loop controllers connected to the local instrument link (LIL). It also determines what information is returned in LOOP STATUS. A single set control block may be used to address up to 12 loops. Multiple set control commands must be used to address more than 12 loops. The set control command enables the programmable controller to:

- select the operating mode of the SLDC
- enter the value of a new setpoint or valve
- enable and acknowledge alarms
- select SLDC status information

The programmable controller sends the set control command to the LIA module via block transfer write instructions. The module interprets the command and sends the appropriate message out to the loop controller over the RS–422 serial link through the ICI.

Important: The loop controller must be in the manual mode to change a valve. The loop controller must be in automatic mode when changing a setpoint.

Word 1 of the set control file (figures 4 and 5) is the block header. This word indicates the beginning of the set control file.

Word 2 identifies the page and loop segment selected. The page number (in hex) is used to identify this particular set control command and its status. Loop segment data bits allow the user to select which loop segment is to be executed for this particular set control command.

Word 3 contains the data and number of loops information. The data bit value identifies the data type being sent. Data is in BCD or binary. Number of loops identifies how many loop segments are being used by this set control command.

Word 4 is reserved for future use.

Word 5 is used to identify the physical station address and loop being accessed, and whose status is being returned. **Note:** If this loop segment data bit is not set, status will still be returned for this station loop (see word 2 above).

Word 6 contains the bits that enable, disable or acknowledge alarms. Refer to figure 5 for an explanation of these bits.

Word 7 determines if a new setpoint or valve value will be sent for this loop segment. Word 7 also contains the loop control bits, which control the operating conditions for this station/loop.

Word 8 holds the new setpoint value (in BCD or binary) to be sent.

Word 9 contains the valve value (in BCD or binary) to be sent.

Setpoint or valve values are 4–digit BCD or Hex numbers which represent percent of scale. These values range between –3.3 (0H) and +103.3% (FFFH). Negative values have their most significant bit set. For example, a setpoint of 50 (BCD) would be entered as 0500. The decimal point is implied before the least significant bit. A value of –3.3% would be entered as 8033 (the most significant bit represents the negative sign).

If an error is encountered during processing of a set control command for a particular station, the set control command will bypass the loop segment in error and attempt to complete the process. Loop status will be returned to the PLC indicating the error and the segment number it occurred in.

Figure 4
Set Control Format (Block Transfer Write)

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				1			
2	Page number				Loop segment select											
3	Data	Reserved							Number of loops							
4	Reserved															
. . . . . Loop Segment																
5	Reserved				Loop number				Station number							
6	Reserved		Alarms in service	Alarms out of service	Alarm disable				Alarm enable				Alarm acknowledge			
7	Valve	Set–point	Reserved						Loop control							
8	Setpoint															
9	Valve															
. . . . . Loop Segment																
60	Reserved				Loop number				Station number							
61	Reserved		Alarms in service	Alarms out of service	Alarm disable				Alarm enable				Alarm acknowledge			
62	Valve	Set–point	Reserved						Loop control							
63	Setpoint															
64	Valve															

Figure 5
Set Control Command Word/Bit Definitions

Word number	Description	Data format	Range
1	Block header	BCD (always 0001)	
2	Loop segment select	Bit 1 = output this loop segment data 0 = ignore this loop segment data	0 to 11
	Page number	Hex (bit 12 – 15)	0 to BH
3	Number of loops	BCD (Bit 8 – 14 reserved)	1 to 12

Word number	Description	Data format	Range
	Data	Bit 15 0 = data format BCD 1 = data format binary	
4	Reserved	0000	
5	Station number	BCD	1 to 64
	Loop	BCD 1 = loop 1 2 = loop 2	1 to 2
6	Alarm ack	Bits 0 1 = alarm 1 ack / 0 = no action 1 1 = alarm 2 ack / 0 = no action 2 1 = alarm 3 ack / 0 = no action 3 1 = alarm 4 ack / 0 = no action	
	Alarm enable	Bit 4 1 = alarm 1 enable/0 = no action 5 1 = alarm 2 enable/0 = no action 6 1 = alarm 3 enable/0 = no action 7 1 = alarm 4 enable/0 = no action	
	Alarm disable	Bit 8 1 = alarm 1 disable/0 = no action 9 1 = alarm 2 disable/0 = no action 10 1 = alarm 3 disable/0 = no action 11 1 = alarm 4 disable/0 = no action	
	Alarms out of service	Bit 12 1 = alarms out of service/0 = no action	
	Alarms in service	Bit 13 1 = alarms in service/0 = no action 14 – 15 Reserved	
7	Loop control	Bit 0 1 = local source/0 = no action 1 1 = console source/0 = no action 2 1 = auto mode/0 = no action 3 1 = manual mode/0 = no action 4 1 = external/0 = no action 5 1 = internal/0 = no action 6 1 = ramp on/0 = no action 7 1 = ramp off/0 = no action 8–13 Reserved	
	Setpoint	Bit 14 1 = use word 8 (new setpoint)	
	Valve	Bit 15 1 = use word 9 (new valve)	
8	New setpoint	BCD/binary	–3.3 to +103.3% (0H to FFFH)
9	New valve	BCD/binary	–3.3 to 103.3% (0H to FFFH)

Loop Status

Loop status is returned for each set control command. Loop status contains information for up to 12 individual control loops (determined by the station and loop numbers entered in the set control command).

The data in this file represents each specified loop controller's current process, setpoint, valve, alarms and status. The status of the 1771–LIA and the Model 320 ICI is also presented in this file. Loop status file format is shown in figure 6.

Loop Status File

Refer to figures 6 and 7. Word 1 (block header) indicates that this is the beginning of the loop status file.

Word 2 contains page number, which identifies this status information with its parent set control command, and loop segment acknowledge bits that indicate if the loop segment selected in the set control command executed properly.

Word 3 contains bits which indicate whether a station is responding (no response) and if no stations in this status page are responding (global response).

Word 4 contains a diagnostic code identifying any error condition, and the loop segment number indicating what segment in the set control command was in error (if applicable). Refer to table C at the rear of this publication for definitions of the diagnostic codes.

Word 5 displays loop status bits, loop number and station number whose status is displayed in a particular segment. Up to 12 loops can be monitored at a time.

Word 6 contains loop status and alarm bits for this station/loop.

Words 7, 8 and 9 contain the station/loop process, setpoint, and valve data. These values are 4–digit BCD or binary numbers which represent percent of scale (–3.3 to 103.3%). Negative values have their most significant bit set.

Figure 6
Loop Status File Format (BTR)

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				1			
2	Page number				Loop segment acknowledge											
3	Data	Reserved		Global response	Segment response											
4	Diagnostic code								Loop segment number							
	. . . . .															

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
5	Loop status				Reserved		Loop number		Station number							
6	Loop status								Alarm on/off				Alarm acknowledge			
7	Process															
8	Setpoint															
9	Valve															

Figure 7
Loop Status Command Word/Bit Definition

Word number	Description	Data format	Range
1	Block header		
2	Loop segment acknowledge	Bit 1 = ack 0 = No ack	0 to 11
	Page number	Hex (bit 12 – 15)	
3	Segment response	Bit 1 = Station response 0 = No station response	0 to 11
	Global response	Bit 12 0 = no stations responding 1 = normal conditions Bits 13 – 14 reserved	
	Data	Bit 15 0 = data in BCD format 1 = data in binary format	
4	Diagnostic	Hex	
	Segment number	Hex	01H–0CH (1–12)
5	Station number	BCD	1 to 64
	Loop number	BCD Bit 10 – 11 reserved	1 to 2
	Loop status	Bit 12 1 = override 13 1 = high setpoint limit 14 1 = low setpoint limit 15 1 = configuration hold	
6	Alarm acknowledge	Bits 0 1 = alarm 1 not acknowledged/0 = ack 1 1 = alarm 2 not acknowledged/0 = ack 2 1 = alarm 3 not acknowledged/0 = ack 3 1 = alarm 4 not acknowledged/0 = ack	

Word number	Description	Data format	Range
	Alarm on/off	Bit 4 1 = alarms 1/0 = no alarm 5 1 = alarms 2/0 = no alarm 6 1 = alarms 3/0 = no alarm 7 1 = alarms 4/0 = no alarm	
	Loop status	Bit 8 1 = Alarms disabled 9 1 = local source 10 1 = console source 11 1 = auto mode / 0 = manual mode 12 0 = external / 1 = internal 13 1 = ramp on/0 = ramp off 14 1 = standby sync 15 1 = emergency manual	8–15
7	Process	BCD/binary	–3.3 to +103.3% (0H to FFFH)
8	Setpoint	BCD/binary	–3.3 to 103.3% (0H to FFFH)
9	Valve	BCD/binary	–3.3 to 103.3% (0H to FFFH)

Read Parameter

The read parameter allows the examination of parameters such as PID parameters, alarm limits and output limits. Up to 20 parameters from a user specified station address can be sent back to the programmable controller. You specify the number of parameters in BCD format (1 to 20). The channel/parameter identifies the particular parameter to be read. Specify the channel and parameter numbers as 1 less than their actual value. For example, channel 1, parameter 1 would be 0000H; channel 256, parameter 256 would be FFFFH. Refer to Moore Products LIL Computer Interface User Manual (AD320) for a description of channel/parameters.

Figure 8
Read Parameters Command File (BTW) and Word/Bit Definitions

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				2			
2	0				0				Station address							
3									Number of parameters							
4	Reserved															
	Data															
5	Channel								Parameter							
	:	:	:	:												
24	Channel								Parameter							

Figure 9
Read Parameter Word/Bit Definitions

Word number	Description	Data format	Range
1	Block header		
2	Station address	BCD	1 to 64
3	Number of parameters	BCD	1 to 20
4	Reserved		
5	Channel Parameter	Binary Binary	0 – 255 0 – 255

Read Parameter Acknowledge

The acknowledge block will be returned to the PLC via block transfer read indicating a good response or an error condition after processing the read parameter command. The 1771–LIA will return the requested parameter data in

the form shown in the following table. The diagnostic code in word 4 identifies any error condition resulting from the read parameter command. Refer to table C at the rear of this publication for definitions of the diagnostic codes.

Figure 10
Read Parameter Acknowledge Format and Word /Bit Definitions

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				2			
2	0				0				Station address							
3	0				0				Number of parameters							
4	Diagnostic								0				0			
	Data															
5	Parameter data 1															
:	:	:	:	:	:											
24	Parameter data 20															

Figure 11
Read Parameter Acknowledge Word/Bit Definitions

Word number	Description	Data format	Range
5–24	Parameter data	Binary	

Modify Parameters

The modify parameters command allows you to modify parameters such as PID parameters, alarm limits, and output limits. You can specify up to 10 parameters to alter for a specified station. Note that the total length of the modify parameter command cannot exceed 64 words.

You must specify the “channel” and “parameter” to be modified. “Data type” and “command” must be provided to specify the parameter data type and source of the parameter data. Refer to Moore Products publication AD320 for definition of these terms. In general, channel and parameter addresses are specified as 1 less than their actual numeric value. For example, channel 1, parameter 1 would be 0000H. Refer to Moore Products LIL Computer Interface User Manual (AD320–10) for a description of channel/parameters.

Figure 12
Modify Parameters Command File Format (BTW)

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				3			
2	0				0				Station address							
3	0				0				Number of parameters							
:	:	:	:	:	:											
4	Channel								Parameter							
5	Type				Command				Number of data words							
6	Data value word 1															
:	:	:	:	:	:											
n + 5	Data value word n															
:	:	:	:	:	:											
n + 6	Channel								Parameter							
n + 7	Type				Command				Number of data words							
n + 8	Data value word 1															
:	:	:	:	:	:											
m + n + 7	Data value word m															

Figure 13
Modify Parameters Command Word/Bit Definitions

Word number	Description	Data format	Range
1	Block header		
2	Station address	BCD	1 to 64
3	Number of parameters	BCD	1 to 10
4	Channel	Binary	0 to 255
	Parameter	Binary	0 to 255

Word number	Description	Data format	Range
5	Type	Hex (bits 12–15) 0 – Record send acknowledge 1 – 16–bit integer, absolute 2 – 16–bit integer, relative 3 – 16–bit multi–discrete mask on 4 – 16–bit multi–discrete mask off 5 – Reserved 6 – 32–bit floating point, absolute 7 – 32–bit floating point, relative 8 – multibyte data (messages) 9 – 32–bit integer, absolute A – 12–bit integer plus range, absolute B–F – not used	
	Command	Hex (bits 8–11) 0–3 – not used 4 – parameter send from a local source 5 – parameter send from a console source 6 – parameter send from a computer source 7 – parameter send from any source 8–F – not used	
	Data words	BCD	1 to 10
6	Parameter data	Binary	

Modify Parameter Acknowledge

An acknowledge block is returned to the PLC by the 1771–LIA after every modify parameter command. The acknowledge block indicates either a good response or an error condition. The diagnostics code in word 4 identifies any error condition resulting from the modify parameter command. Refer to table C at the rear of this publication for definitions of the diagnostic codes. Block format is shown below.

Figure 14
Modify Parameters Response File (BTR)

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				3			
2	0				0				Station address							
3	Reserved															
4	Diagnostic								0				0			

Upload

The upload function is used to transfer configuration data from the specified loop controller to the configuration buffer on the 1771–LIA. The full database consists of a 1Kbyte buffer with 4 records of 256 bytes each. The upload

command will trigger generation of a record request to the ICI. An acknowledgement of the upload command is returned in the form of a block transfer file similar to the upload command block .

Start and End specify the starting and ending addresses of the records to be uploaded. Station address is the address of the station whose data is to be recorded. For example, if all four records are to be uploaded, the start address would be 08H, and the end address would be 0BH.

Figure 15
Upload Configuration Command File (BTW)

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				4			
2	End				Start				Station address							

Figure 16
Upload Configuration Command File (BTW)

Word	Description	Data format	Range
1	Block header		
2	End Start Station address	Binary Binary BCD	00 – 0FH 00 – 0FH 1 to 64

Upload Acknowledge

An upload acknowledge block is returned to the PLC by the 1771–LIA after every upload command. The upload acknowledge block indicates either a good response or an error condition. The upload acknowledge block format is shown below.

Figure 17
Upload Acknowledge Command Format

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				4			
2	End				Start				Station address							
3	Reserved															
4	Diagnostic								0				0			

Download

The download function is used to transfer the contents of the 1771–LIA configuration buffer to the specified loop controller. It results in a record send transaction to the ICI for each configuration record. END specifies the ending record to down load. If all 4 records of a Moore 352 controller are to be transferred, START would equal 08H and END would equal 0BH. NOTE: The receiving station must be in the configuration hold mode prior to execution of this command. The format of the download command is shown below.

Figure 18
Download Configuration Block

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				5			
2	End				Start				Station address							

Figure 19
Download Command Word/Bit Definitions

Word number	Description	Data format	Range
1	Block header		
2	End	Binary	0–FH
	Start	Binary	0–FH
	Station address	BCD	1 to 64

Download Acknowledge

The format of the download acknowledge block is shown below.

Figure 20
Download Acknowledge Block Format

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				4			
2	End				Start				Station address							
3	Reserved															
4	Diagnostic								0				0			

Read Configuration

The read configuration command allows transfer of information from the 1771–LIA configuration buffer to the programmable controller. This command must be preceeded by an **upload** command.

The configuration data for the loop controller can be found on four 256 byte records. The maximum file length allowed for a BT is 64 words. A complete record request requires 256 bytes (128 words). Since an overhead of 4 words is required for the upload file, a single record request cannot exceed 60 words (120 bytes). Therefore, 12 block transfers need to be performed if a complete configuration upload (1Kbytes) is desired.

The record number is the record address containing the data to be returned. It has a maximum range of 0–FH. The offset is the offset from the beginning of the record where the data transfer begins, and has a range of 00H to FFH (figure 20).

The number of bytes transferred is the number of bytes beginning at the record plus the offset (figure 20). This is in the range of 01H to 78H. The offset plus (number of bytes – 1) must not exceed 256.

Figure 21
Read Configuration Command File (BTW)

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				6			
2	0				0				Station address							
3	0				Record number				Offset							
4	0				0				Number of bytes							

Figure 22
Read Configuration Word/Bit Definition

Word number	Description	Data format	Range
1	Block header		
2	Station address	BCD	1 to 64
3	Record number	Binary	0 to FH
	Offset	Binary	00 to FFH
4	Number of bytes	Binary	01H to 78H

Read Configuration Acknowledge

An acknowledge block will be returned to the PLC indicating either a good response or an error condition in obtaining the requested data from the 1771–LIA configuration buffer. The acknowledge block format is shown below.

Figure 23
Read Configuration Acknowledge Block

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				6			
2	0				0				Station address							
3	Reserved															
4	Diagnostic								0				0			
:	:	:	:	:	:											
5	Record byte 1								Record byte 2							
:	:	:	:	:	:											
n	Record byte n															

Write Configuration

The write configuration command allows the transfer of information from the programmable controller to the 1771–LIA configuration buffer. The length of the record being transferred cannot exceed 60 words (120 bytes). The station address is the station whose data record is in the 1771–LIA buffer. This address must match the address stored in the LIA configuration buffer in order for processing to be completed. The record number is record address containing the data to be returned. The maximum range is 0–FH. The offset is the offset from the beginning of the record where the data transfer is to begin. Offset range is 00H to FFH. The number of bytes is the number of bytes beginning at the record plus the offset to be transferred. This range is 01H to 78H (1 to 120). The offset plus (number of bytes – 1) cannot exceed 256.

Figure 24
Modify Configuration Command File (BTW)

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				7			
2	0				0				Station address							
3	0				Record number				Offset							
4	0				0				Number of bytes							
5	Record byte 1								Record byte 2							
:	:	:	:	:	:											
n	Record byte n															

Figure 25
Write Configuration Word/Bit Definition

Word number	Description	Data format	Range
1	Block header		
2	Station address	BCD	1 to 64
3	Record number	Binary	0 to 0FH
	Offset	Binary	00 to FFH
4	Number of bytes	Binary	01H to 78H

Write Configuration Acknowledge

An acknowledge block will be returned to the PLC indicating either a good response or an error condition in sending the data to the 1771–LIA configuration buffer. The acknowledge block format is shown below.

Figure 26
Write Configuration Acknowledge Block

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				7			
2	0				0				Station address							
3	Reserved															
4	Diagnostic								0				0			

ICI Command

The 1771–LIA ICI command allows the user to send a Moore ICI command to the ICI. The ICI performs the necessary byte reversal and adds the command checksum word. Page number is a hex value that can be used by the operator to identify multiple command operations. No other modification of the command is performed. Note: The command word count cannot exceed 60 words, due to block transfer limitations. The ICI command format is shown below.

Figure 27
ICI Command Block Format

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				8			
2	Page number				0				Command word count							
3	ICI command code															
. . . . .																
n																

ICI Acknowledge

The ICI acknowledge block will be returned to the PLC indicating either a good response or an error condition. The ICI acknowledge block will contain the following information.

Figure 28
ICI Acknowledge Block Format

Word | Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0				0				0				8			
2	Page number				0				0				0			
3	Reserved															
4	Diagnostic								0				0			
	. . . . .															
5	Response status word															
	. . . . .															
n																

Data Formats

The 1771–LIA can interpret two types of data from the PLC; Binary and BCD. In BCD, the value is expressed as a series of four decimal digits, 1 digit per nibble. The high order digit is restricted in value so that its high order bit can be used as a sign bit. This allows indication of a negative value. The decimal point is assumed to be one place from the right. The 1771–LIA module converts this BCD value to a binary data format for the ICI.

For example, the value 100.2 would be expressed as:

1	0	0	2

The value –3.1 would be expressed as:

8	0	3	1

In the Binary format, data is used directly by the Loop Controller. When specifying an absolute value, the input range is –3.3 to 103.3%. This is represented by a value ranging from 0 to 4095, with 0% being 128. For example, the value 103.3% would be:

0	F	F	F

The value 0% would be:

0	0	8	0

A value of 20% would be:

0	3	8	0

Relative values are in the range of –50% to 0 to +50%. For example:

0%	0	0	0	0
50%	0	7	F	F
–50%	0	8	0	0
1 bit	0	F	F	F

Interpreting the Status Indicators

Three LED indicators on the front of the loop controller interface module indicate the operating status of the module (figure 29). Use these indicators to aid in troubleshooting.

The red MODULE FAULT indicator lights when a communication problem exists (either the ICI or 1771–LIA). The yellow CHANNEL ACTIVE indicator blinks during normal operation. It is on when the module receives data and is off when the module is sending data. The green MODULE ACTIVE indicator lights when power is applied and the module passes its power up test.

Figure 29
Loop Controller Interface Module Diagnostic Indicators

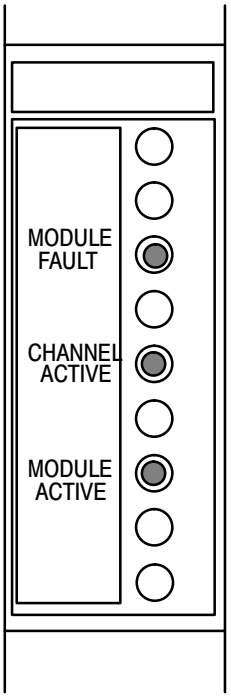


Table B
Interpreting the Indicator Lights on the Loop Controller Interface Module

Indication	Probable cause	Corrective action
MOD ACTIVE (green) ON MOD FAULT (red) OFF CHANNEL ACTIVE (yellow) flashing	Normal operation	
MOD ACTIVE (green) OFF MOD FAULT (red) OFF CHANNEL ACTIVE (yellow) OFF	Module has failed to power up correctly.	Cycle power to module. Check power connectins on field wiring arm. Replace faulty 1771–LIA module.
MOD ACTIVE (green) ON MOD FAULT (red) ON CHANNEL ACTIVE (yellow) ON or OFF	Communications have been lost between the 1771–LIA and the ICI.	Check field wiring arm connections. Check operation of the ICI.

Diagnostic Codes

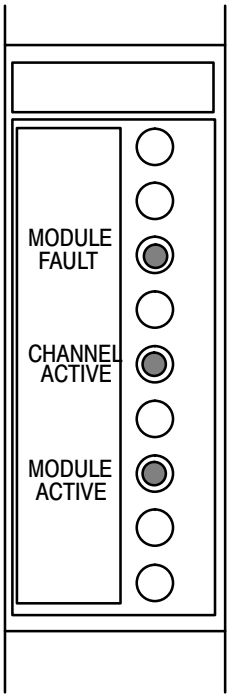
The following table describes the diagnostic and ICI error codes returned in the Acknowledge block when an error occurs. The diagnostic code provides you with a quick reference to the problem.

Table C
Diagnostic Command Summary

Diagnostic Code	Description	Explanation
	GENERAL COMMAND ERRORS	
01H	Invalid command	Attempted to process an invalid command from the PLC
02H	Invalid station address	Attempted to access a station address outside the 64 allowed
03H	Invalid number of loops	Attempted to process more than 12 loops, or 0 loops with a set control command
04H	Data value out of range	Attempted to process a setpoint or valve value greater than 103.3% with a set control command
05H	Dual command error	Attempted to place the loop controller in 2 opposite modes at the same time with the set contrtol command
06H	Invalid loop number	Attempted to process a loop number outside the range of 1 or 2 with the set control command
07H	Invalid BCD digit	Attempted to process an invalid BCD value with the set control command
08H	Number of parameters invalid	Attempted to request or send too many parameters
09H	Too much read data	Execution of command resulted in too much data to be returned in a single block transfer
0AH	Too much write data	Attempt to process an LIA command with a word count greater than allowed
26H	Unknown error code	The LIA is unable to determine an error code returned by the ICI
	COMMUNICATION ERRORS	
0CH	Checksum error	Checksum calculated by the LIA does not match the checksum returned by the ICI for data being returned by the ICI
0DH	Data overrun	Byte count calculated by the LIA does not match the count being returned by the ICI
0EH	Communications timeout	Attempted to read an expected response from the ICI for more than 1 second
0FH	Buffer overrun	Storage capacity in LIA receive buffer exceeded
	RECORD HANDLING ERRORS (1771–LIA)	
13H	Non–matching station address	PLC attempted to modify or read configuration record using a station address that does not match the station configuration record that was loaded
14H	Invalid record number	Attempted to process a record number greater than maximum allowed, or attempted to read records in wrong order

Diagnostic Code	Description	Explanation
15H	Too many requested records	Attempted to read more than 4 records at one time (exceeds LIA record storage capacity)
16H	Buffer boundary exceeded	Attempted to read or modify data in a record storage area within the LIA that is out of the storage area for that record
	ICI OPERATIONAL CODES	
19H	LIL database not updating	Return of the response status word from the ICI indicating the LIL data base is not being updated
25H	ICI Download error	Attempted to download a record to a station that is unable to accept it
1AH	LIL interface not online	Return of the response status word from the ICI indicating the local instrument link is not present
1CH	Data not ready	Return of the response status word from the ICI indicating that data has been requested from a station but has not been received by the ICI
ICI Codes		
	ICI TRANSMISSION ERRORS	
80H	Timeout between characters	
81H	Invalid data or bad character	
82H	Invalid command	
83H	Invalid request	
84H	Word count error	
85H	Checksum error	
86H	Message overflow	
87H	Parity or framing error	
	LIL INTERFACE ERRORS	
88H	Transfer prevents command execution	
89H	Station not in global database	
8AH	Data not available	
8BH	Local link buffers full	
8CH	Global database not ready	
8DH	Parameter send abort (timeout)	
8EH	Record transfer abort (timeout)	
8FH	Record transfer abort (not ready)	

Diagnostic Code	Description	Explanation
	LIL HARDWARE FAILURES	
90H	Link not present	
91H	On–board dual–port board	
92H	Local RAM	
93H	ROM check	
94H	Link physical interface failure	
97H	Off–board dual–port RAM	
	ICI HARDWARE FAILURE	
99H	ICI buffer RAM	
9AH	Local RAM	
9BH	ROM check	
9CH	Piggyback board	
9DH	Receive timeout	
9EH	Transmit timeout	
	LINK COMMAND ERRORS	
A1H	Transmission problem	
A2H	Destination buffers full	
A3H	Destination station offline	
A4H	Gateway offline	
A5H	Link command checksum error	



Compatibility

The user must be familiar with the terminology, configuration and operation of Moore Products Model 352 Single Loop Digital Controller (SLDC) and Model 320 Independent Computer Interface (ICI). Depending on the application, you must also be familiar with Moore Products Model 321 Local Expansion Satellite (LES).

Proper operation of the Loop Controller Interface Module depends upon correct setup of the Model 320 ICI. Set the ICI as follows:

Parameter	Set–up	Switch Location
ICI link address	(see note)	serial board SW1, 2
Baud rate	9600	serial board W7
RS–232–C/RS–422	RS–422	serial board W5, W6
Transmission method	Binary	MPU board SW5 closed
Link Acknowledgement Delay	Enabled	MPU board SW4 open
Null filling	Enabled	MPU board SW3 open
Send command security	Disabled	MPU board SW1, 2
Format	1 start, 8 data, 1 stop, no parity	SW2 – 8 off, SW2 – 4 on

Note: The 1771–LIA provides an interface with up to 61 Moore Products 352 controllers, depending on the Moore hardware configuration. The 1771–LIA uses one Model 320 ICI to provide access to either Moore's lower instrument link (addresses 1 – 32), or to the upper instrument link (addresses 33 – 64). You can use the Model 321 LES to join both lower and upper instrument links to provide a total of 64 link addresses. Note that the Moore Products Model 320 requires one link address, and the Model 321 requires two link addresses.

If you have a Model 321, you can address Moore 320, 321 and 352s from 1 to 64. Therefore, you can interface with up to 61 Model 352s.

If you don't use a Model 321, you can address Moore Models 320 and 352 from 1 to 32, or 33 to 63. Therefore, you can interface with up to 31 Model 352s.

Refer to Moore Products publications AD320–10 (Local Instrument Link Computer Interface User's Manual), AD352–10 (MYCRO 352 Single Loop Digital Controller User's Manual) and AD321–40 (Model 321 Expansion Satellite Link Interface Communication User's Manual).

Specifications

Module Location
- 1771 I/O Chassis

Output oltage Range
- 0 – 5V

Output Load Current
- 60mA maximum

Maximum Surge Current
- 1.2A

Minimum Load Current
- 0.72A

Power Dissipation
- 4.5W normal

Thermal Dissipation
- 0.256 BTU/minimum

Environmental Conditions
- Operational Temperature
  0º to 60ºC (32º to 140ºF)
- Storage Temperature
  –40º to 85ºC (–40º to 185ºF)
- Relative Humidity 5% to 95%
  (without condensation)

Conductors
- Wire size
  14 ga. stranded (max)
  3/64 inch insulation (max)
- Category 1[1]

eying Band Positions
- Between 12 and 14
- Between 16 and 18

Wiring Arm Screw Tor ue
- 9 pound–inches

[1] Refer to publication 1770–4.1, Programmable Controller Wiring and Grounding Guidelines

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